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annual report

1966



PACIFIC NORTHWEST
FOREST AND RANGE EXPERIMENT STATION
U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

1967

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Cover photo: Station research reaches into the North Cascades. The scene is fragile Larch Lake, like a solitaire, high upon Fifth of July Mountain. Entiat River in upper right.

INTRODUCTION

In retrospect, 1966 was another year of progress at the Pacific Northwest Forest and Range Experiment Station.

Some research produced new knowledge ready for application in action programs. Some uncovered promising leads that may point the way to solutions of long-troublesome problems.

As in previous years, most of the Station's work was performed in cooperation with others. The States, universities, the National Forests, Bureau of Land Management, other public agencies, and the forest industries--all contributed importantly to progress in providing the knowledge needed to better manage and use the Northwest's forests, ranges, and watersheds.

At midyear, the Congress provided funds for building some facilities needed to increase the efficiency of future research and for planning other research laboratories scheduled for early construction. As a result, building of the Silviculture and Animal Problems Laboratory at Olympia started in November 1966. The structure should be ready for use early in the fall of 1967. Preparation of plans and specifications for the Range and Wildlife Habitat Research Laboratory at La Grande and the second phase of the Forestry Sciences Laboratory at Corvallis also began in November and will be completed in May and June 1967, respectively.

Near the year's end, study of proposals to more closely join the research programs

of the Pacific Northwest Station and those of the Institute of Northern Forestry Research in Alaska, formerly the Northern Forest Experiment Station, was started. In followup, research support services at the Pacific Northwest Station, such as library, biometrical analysis, editing, and engineering, are being extended to the Institute of Northern Forestry.

Following pages outline the staff and research project organization and show the location of the main Forest Service research installations in Oregon and Washington in 1966. Two key changes at the end of the year deserve mention. Assistant Director and economist Carl Newport resigned to become a member of the consulting forestry firm of Mason, Bruce and Girard. His successor, Donald Flora, previously in forest economics research at the Station and presently project leader for forest fire danger rating research in Seattle, will take over his new assignment the fore part of 1967. Assistant Director and entomologist Robert Furniss retired to devote his energies to revising the bulletin "Insect Enemies of Western Forests" as an expert consultant at the Station. His successor as Assistant Director is Kenneth Wright, entomologist at the Station and well known in forest protection circles in the West.

Other parts of this report summarize research progress in the form of highlights of 1966 developments and in the list of publications issued during the year. We shall welcome inquiries about any of these as well as suggestions you may have on any part of the Station's work.

STATION ADMINISTRATION STAFF PROJECTS AND SCIENTISTS - 1966

BRIEGLEB, PHILIP A.

DIRECTOR

FOREST SURVEY, FOREST ECONOMICS, FOREST PRODUCTS, MARKETING AND UTILIZATION, AND ENGINEERING RESEARCH

NEWPORT, CARL A., Asst. Director (resigned) (P)¹

4101 Forest Survey-PNW

Metcalf, Melvin E., Project Leader (P)

Gedney, Donald R., Resource Analyst (P)

Hazard, John W., Assoc. Mensurationist (P)

Berger, John M., Assoc. Mensurationist (P)

Oswald, Daniel D., Assoc. Resource Analyst (BC)

Bolsinger, Charles L., Assoc. Mensurationist (P)

Wall, Brian R., Assoc. Economist (P)

Muerle, Gerhard F., Assoc. Mensurationist (BC)

Howard, James O., Asst. Mensurationist (P)

4102 Survey Techniques-PNW

Pope, Robert B., Project Leader (P)

Haack, Paul M., Jr., Mensurationist (P)

4201 Production Economics-PNW

Schallau, Con H., Project Leader (P)

Chappelle, Daniel E., Princ. Economist (P)

Payne, Brian R., Assoc. Economist (P)

Sassaman, Robert W., Assoc. Economist (P)

4301 Marketing-PNW

Beuter, John H., Project Leader (P)

Adams, Thomas C., Economist (P)

Hamilton, Thomas E., Economist (P)

3602 Regional Utilization Problems

Grantham, John B., Project Leader (S)

Oviatt, Alfred, Jr., Princ. Research Architect (S)

Heebink, Thomas B., Princ. Research Engineer (S)

3101 Wood Quality Research

Lane, Paul H., Project Leader (P)

Henley, John W., Wood Technologist (P)

Woodfin, Richard O., Jr., Wood Technologist (P)

Plank, Marlin E., Assoc. Wood Technologist (P)

Levitan, Jack S., Assoc. Mensurationist (P)

3701 Forest Engineering

Lynsons, Hilton H., Project Leader (S)

Mann, Charles N., Mechanical Engineer (S)

Binkley, Virgil W., Assoc. Logging Engineer (S)

¹(P) Portland, Oregon

(C) Corvallis, Oregon

(B) Bend, Oregon

(W) Wenatchee, Washington

(O) Olympia, Washington

(L) La Grande, Oregon

(R) Roseburg, Oregon

(S) Seattle, Washington

(BC) Berkeley, California

TIMBER MANAGEMENT AND FOREST FIRE RESEARCH

MEAGHER, GEORGE S., Asst. Director	(P)	1206 Brushfield Reclamation	
1201 Seeding, Planting, and Nursery Practice		Gratkowski, Henry J., Project Leader	(R)
Stein, William I., Project Leader	(P)	1207 Silviculture of Douglas-fir	
Krueger, Kenneth W., Plant Physiologist	(C)	Miller, Richard E., Project Leader	(O)
Edgren, James W., Assoc. Plant Ecologist	(P)	Reukema, Donald L., Silviculturist	(O)
1401 Breeding Northwestern Trees		Williamson, Richard L., Assoc. Mensurationist	(O)
Silen, Roy R., Project Leader	(C)	1208 Animal Damage Control	
Sorensen, Frank C., Assoc. Plant Geneticist	(C)	Tackle, David, Project Leader	(O)
Copes, Donald L., Assoc. Plant Geneticist	(C)	Dimock, Edward J., II, Silviculturist	(O)
1203 Silviculture of Interior Conifer Types		Radwan, Mohamed A., Plant Physiologist	(O)
Berntsen, Carl M., Project Leader	(B)	Crouch, Glenn L., Plant Ecologist	(O)
Dahms, Walter G., Princ. Silviculturist	(B)	1301 Mensuration-PNW	
Barrett, James W., Silviculturist	(B)	Bruce, David, Project Leader	(P)
1204 Silviculture of True Fir-Mountain Hemlock and Sitka Spruce-Western Hemlock Types		Curtis, Robert O., Mensurationist	(P)
Ruth, Robert H., Project Leader	(C)	2103 Fuel Inventory Systems	
Herman, Francis R., Mensurationist	(C)	Fahnestock, George R., Project Leader	(S)
Franklin, Jerry F., Plant Ecologist	(C)	Morris, William G., Forest Fuels Scientist	(S)
Minore, Don, Assoc. Plant Ecologist	(C)	Lund, Herluf G., Assoc. Photogrammetrist	(S)
1205 Silviculture of Mixed Pine-Fir Forests		2104 Fire Danger Rating	
Hallin, William E., Project Leader	(R)	Flora, Donald F., Project Leader	(S)
		Hefner, James E., Assoc. Fire Systems Analyst	(S)

FOREST INSECT AND DISEASE RESEARCH

FURNISS, ROBERT L., Asst. Director (retired)	(P)	2203 Diseases of Western Forest Insects	
2201 Forest Insect Biology and Ecology		Thompson, Clarence G., Project Leader	(C)
Wright, Kenneth H., Project Leader	(P)	Martignoni, Mauro E., Princ. Microbiologist	(C)
Mitchell, Russel G., Entomologist	(P)	Wittig, Gertraude, Microbiologist	(C)
Mason, Richard R., Entomologist	(C)	Maksymiuk, Bohdan, Princ. Entomologist	(C)
Sartwell, Charles, Jr., Assoc. Entomologist	(P)	2301 Diseases Reducing Forest Production	
2204 Forest Insect Nutrition and Behavior		Shea, Keith R., Project Leader	(C)
Carolin, Valentine M., Jr., Project Leader	(P)	Childs, Thomas W., Princ. Plant Pathologist	(P)
Ryan, Roger B., Entomologist	(C)	Aho, Paul E., Plant Pathologist	(C)
Coulter, William K., Assoc. Entomologist	(P)	Harvey, George M., Plant Pathologist	(C)
Schmidt, Fred H., Assoc. Entomologist	(C)	2302 Root Diseases and Soil Microbiology	
Daterman, Gary E., Assoc. Entomologist	(C)	Trappe, James M., Project Leader	(C)
		Zak, Bratislav, Princ. Plant Pathologist	(C)
		Nelson, Earl E., Plant Pathologist	(C)
		Lu, Kuo C., Microbiologist	(C)

WATERSHED MANAGEMENT, RECREATION, RANGE MANAGEMENT, AND WILDLIFE HABITAT RESEARCH

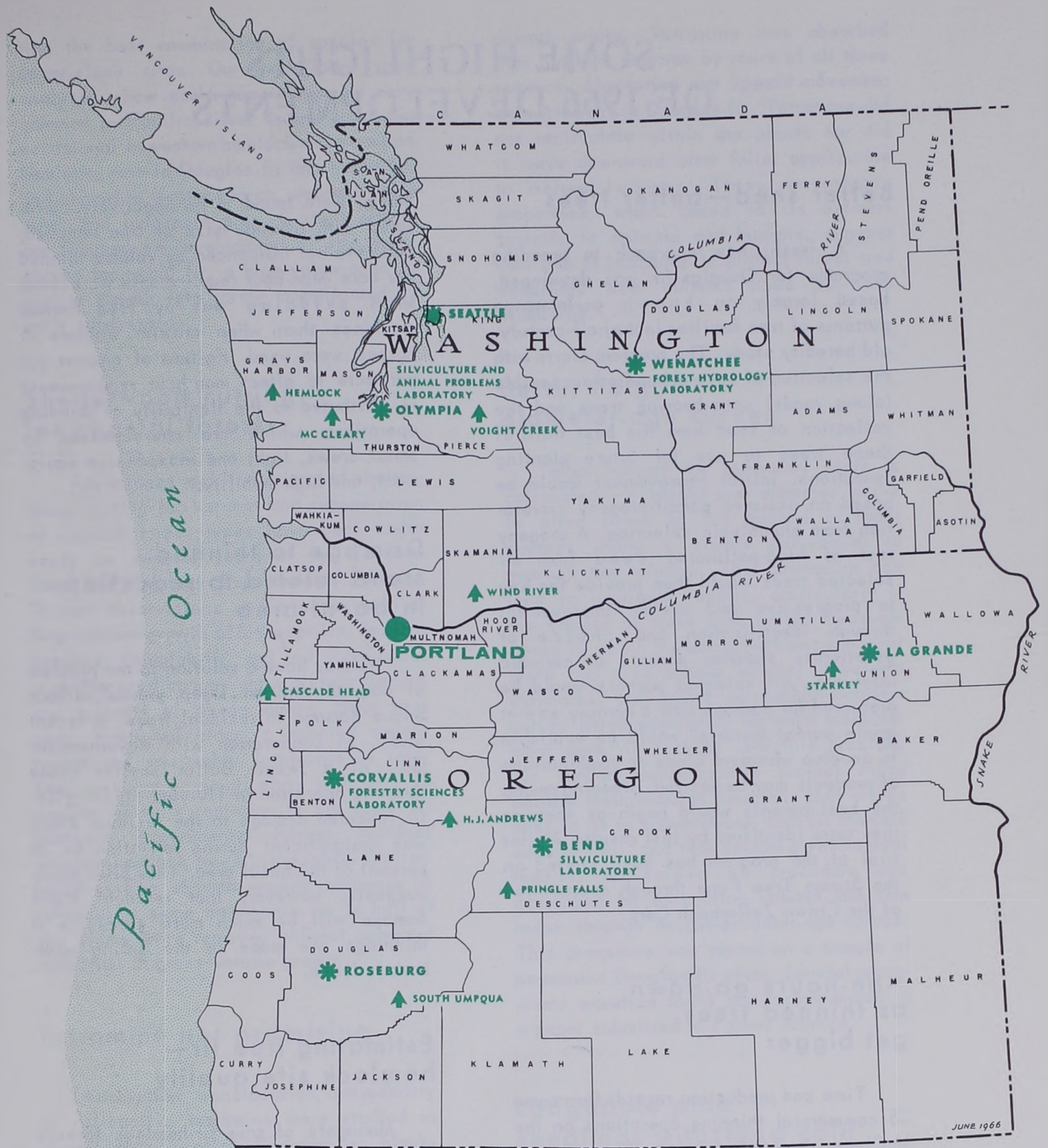
HARRIS, ROBERT W., Assistant Director	(P)	1701 Range Ecology and Management-NW	
1601 Water Yield and Erosion		Garrison, George A., Project Leader	(L)
Berndt, Herbert W., Project Leader	(W)	Goebel, Carl J., Plant Ecologist	(L)
Wooldridge, David D., Soil Scientist	(W)	Strickler, Gerald S., Plant Ecologist	(L)
Herring, Harold G., Hydrologist	(W)	Skovlin, Jon M., Range Scientist	(L)
Fowler, William B., Meteorologist	(W)		
Lopushinsky, William, Plant Physiologist	(W)	1801 Big-Game Habitat-PNW	
1602 Watershed Logging Methods and Streamflow		Smith, Justin G., Project Leader	(L)
Rothacher, Jack S., Project Leader	(C)	McConnell, Burt R., Plant Ecologist	(L)
Dyrness, C.T., Princ. Soil Scientist	(C)	Dealy, J. Edward, Assoc. Plant Ecologist	(L)
Fredriksen, Richard L., Assoc. Soil Scientist	(C)	Edgerton, Paul J., Assoc. Plant Ecologist	(L)
1603 Pesticides-Soil and Water		1901 Wilderness Recreation Dynamics	
Tarrant, Robert F., Project Leader	(C)	Burke, Hubert D., Princ. Recreation Spec.	(W)
Moore, Duane G., Soil Scientist	(C)	Hendee, John C., Assoc. Recreation Spec.	(S)
Bollen, Walter B., Princ. Soil Microbiologist	(C)		

BIOMETRICS

JOHNSON, FLOYD A., Princ. Biometrician (P)

RESEARCH SUPPORT SERVICES

PETERSEN, CHAS. J., Assistant Director	(P)	Knutson, Maurice C., Library	(P)
Logan, Joseph, Business Management	(P)	Hansen, George M., Publications	(P)
Martin, Dorothy E., Statistics	(P)	DiBenedetto, A.P., Architecture/Engineering	(P)



- STATION HEADQUARTERS
- * FIELD UNIT HEADQUARTERS
- ▲ EXPERIMENTAL FORESTS AND RANGES

PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
FOREST SERVICE ... U.S. DEPARTMENT OF AGRICULTURE

SOME HIGHLIGHTS OF 1966 DEVELOPMENTS

Better seed—better trees

A fresh, new approach to breeding programs for Douglas-fir was developed, based largely on known performance patterns of tree families in the half-century-old heredity study. The program starts with the selection of several hundred accessible (along roads) cone-bearing trees and the collection of seed from the best third of these trees to use for future planting operations. Initial improvement would be based on assumed parent-progeny correlation from phenotypic selection. A progeny test of wind-pollinated seed from all selected trees would then provide the key to progressive and certain improvement through identification and choice of genetically superior parents at periodic intervals. All selected parents would be protected for perhaps half a century so that ample parent material would be available to develop whatever kinds or combinations of products may be desired. Breeding among the best parents would begin as soon as they were identified by test results. A pilot trial of the program has been started on the Stamm Tree Farm through cooperation of the Crown Zellerbach Corp.

Man-hours go down as thinned trees get bigger

Time and production records from some 25 commercial thinning operations on the McCleary and Hemlock Experimental Forests were analyzed to determine how labor requirements were related to other factors. Man-hours per 100 cubic feet re-

moved were found to be negatively correlated with average size of tree removed, but were not influenced by volume thinned per acre. Man-hour requirements were lower when skidding was by Tree Farmer machines than when crawler tractors or horses were used. Failure of amount cut per acre to affect man-hour requirements is attributed to the flexibility of thinning operations which are characterized by small crews, light and inexpensive equipment, and high mobility.

Damage to thinned stand related to reduction in basal area

We may have a solution to the problem of how to thin on steep ground without undue damage to residual trees. A recent study, in cooperation with Weyerhaeuser Co., of a Skagit Bullet skyline crane thinning operation in 110-year-old Douglas-fir revealed damage to the residual stand was insignificant during reduction by 24 percent of the basal area. This pilot study suggests, however, that residual stand damage will be much more extensive if thinnings are made in the spring when bark is loose.

Estimating true fir— hemlock site quality

Managers of true fir-hemlock forests need systems for estimating timber growth rates and productive capacity. This information is essential for improving timber management planning and for selec-

ting the best combination of species for upper-slope sites. Our exploratory stem analyses show early suppression is very common in Pacific silver fir and grand fir; occasional in western hemlock and mountain hemlock; rare in Douglas-fir and noble fir; and absent in western larch, western white pine, and lodgepole pine. Current efforts are focused on development of site index curves for noble fir, a high-value species with a growth rate rarely complicated by early suppression.

Shelterwood cutting for coastal forests

Advantages and limitations of shelterwood cutting for harvest and regeneration of coastal forest types have been under study for several years at the Cascade Head and Hemlock Experimental Forests. Recent observations at Cascade Head of first-season growth of Sitka spruce, western hemlock, Douglas-fir, and red alder under a shelterwood canopy show all four species are tolerant of shade during their first year. Even red alder, a species widely recognized as highly intolerant in later life, survived on small plots with only 25 percent of solar radiation in the open. At Hemlock Experimental Forest, residual western hemlock trees in the initial shelterwood cutting showed marked response to release. In some treatments, up to half of the stems were removed without apparent reduction in gross volume growth.

Tetramine not promising

Absorption, translocation, and mobility of radioactive tetramine were studied in three plant species--Douglas-fir, blackberry, and orchard grass--to explore potential use of this chemical as a systemic for protecting forest tree seedlings from

animal injury. Tetramine was absorbed from nutrient solution by roots of all three species. Absorption and upward movement were slowest in Douglas-fir. Tetramine did not recirculate within the plants nor did it move downward after foliar application to mature leaves. These nonsystemic properties, when added to its extreme toxicity to animals and humans, suggest that use of tetramine to protect forest tree seedlings from animals does not look promising.

Better height-diameter-age curves

When volume for temporary plots is calculated, a height-over-diameter curve is often fitted by the method of least squares using a simple polynomial to express the relation. This procedure can lead to irrational results, particularly if the sample of trees with height measurements is small. Volume growth on permanent plots can also appear erratic, if volume estimates are based on height-diameter curves fitted separately for each measurement date. In looking into this problem, our timber measurements project found several mathematical functions that are as easy to fit as polynomials, that fit the data equally well, and that seldom give illogical results. An improved procedure was developed for estimating volume and site index through height-diameter-age curves. This procedure was tested on a sample of permanent Douglas-fir plots. Several appropriate equation forms are recommended in a paper submitted to Forest Science.

Lodgepole pine seedlings withstand cold

Integrated field and laboratory studies at the Bend Silviculture Laboratory show

that lodgepole pine seedlings are more resistant to cold than ponderosa pine. This difference helps to explain why many suspected frost-pocket sites in central Oregon are occupied exclusively by lodgepole pine. In the controlled environment chamber, single night exposures of 15° to 18° F. caused heavy losses (sometimes approaching 100 percent) of newly germinated ponderosa pine seedlings compared with moderate or light losses of lodgepole pine. Field records confirm that late-spring, postgermination temperatures drop to this level on lodgepole pine flats. In contrast, minimum temperatures on adjacent slopes, which support both pine species but where ponderosa pine predominates, were found to be 5° to 6° F. higher. This information will help forest managers recognize sites that should be devoted primarily to culture of lodgepole pine.

When to burn slash

More refined guidelines were issued for broadcast burning clearcut tracts in the Douglas-fir region in order to remove hazardous slash accumulations without risk of fires spreading or spotting into adjacent green timber. Information needed includes moisture content of standard indicator sticks exposed in the slash and adjoining timber, prevailing aspect, and visual observations of moisture content of lower duff. The new guidelines are based on observations of a large number of broadcast burned tracts on six National Forests west of the Cascade Range divide during 1963 and 1964. Their use will improve efficiency of slash burning operations.

Additional information on the ecological effects of broadcast slash burning in Douglas-fir was developed through a reanalysis of records from 13 pairs of plots

near Oakridge, Oregon, covering the first 11 to 16 years after burning. More conifer regeneration was found on unburned plots for the first 6 years. In the 7th year, however, the difference was no longer significant. More brush occurred on unburned plots for the first 5 years; by 7 years, differences were again not significant. Snowbrush and varnishleaf ceanothus occurred much more frequently on burned than unburned plots; Pacific rhododendron was more common on unburned areas.

Trees waste water

Growing trees use less than 5 percent of the water they take in; 95 percent or more of the water passes through the tree and evaporates into the air--wasted.

However, some species waste more water than others. The goal of studies at the Wenatchee Forest Hydrology Laboratory is to identify the trees that conserve the water supply and to foster their growth.

Preliminary results show that, as the water becomes scarce, ponderosa and lodgepole pines conserve water better than Douglas-fir. At 10 atmospheres of moisture stress, the transpiration of pines slowed down to only 13 percent of their peak loss, and that of other species maintained 40-55 percent of their peak loss. This may suggest a preference for pines over Douglas-fir and other species along the east slope of the Cascades.

Preventing landslides

A joint study with Region 6 of the Forest Service since early 1965, showed that mass soil movements occurring in the form of earthflows, slumps, channel scouring, debris slides, and debris avalanches

are a major form of erosion on forested lands of the Pacific Northwest.

A majority of 47 mass soil movements on the H. J. Andrews Experimental Forest occurred on steep slopes; 83 percent were on slopes over 45 percent. Although only 8 percent of the area is underlain by greenish tuffs and breccia, 64 percent of the mass soil movements were found on this rock type. Man's activities also appear to be related to the frequency of these events. On the Experimental Forest, 72 percent of the observed mass soil movements were in some way connected with roads; another 17 percent with logged areas; and 11 percent were found in undisturbed areas. The relationship is more obvious when we consider that about 84 percent of the area is still undisturbed, 14 percent is clearcut logged, and only 2 percent is in road rights-of-way. These findings identify potentially hazardous areas and the need to design roads and other improvements in such a way that soil stability is maintained or improved.

Rain contains more than water

Very little nitrogen is brought into a coastal Oregon forest ecosystem in precipitation. Sampling and analysis of a full year's precipitation in an open area on the Cascade Head Experimental Forest indicated that of a yearly total nitrogen addition of about 1.3 pounds per acre, only 0.2 pound was inorganic nitrogen that might be regarded as an addition to the site. The balance, 1.1 pounds, was in the organic form, presumably contributed by locally generated airborne debris. Information from this study is useful not only from the standpoint of atmospheric pollution but also in connection with studies of plant nutrient accretion and cycling in coastal Oregon forests.

Cattle, soil, and roots

On the Starkey Experimental Forest and Range, a 13-year study of cattle grazing under three rates of stocking and two grazing systems was completed. Preliminary results showed maximum gains per head were obtained under light stocking, with heavy stocking providing the least weight gains. No real difference in animal gain was shown between systems of grazing. However, in terms of amount of watershed cover, deferred-rotation was superior to season-long grazing.

Preliminary results from a supplementary soil compaction study showed that density of surface soil on shallow grassland sites increased directly with intensity of grazing. This was also true for one of the major soil series on timbered sites.

Effects of stocking rates and grazing systems on root reserves of bluebunch wheatgrass and elk sedge were also investigated. There was a greater percent composition of total carbohydrate reserves with light and moderate stocking than under heavy stocking. Carbohydrate accumulation also tended to be greater with deferred-rotation grazing than with season-long system.

Thinning increases forage

Studies on the Methow Game Range, in cooperation with the Washington State Department of Game, and on the Pringle Falls Experimental Forest in Oregon have shown how thinning stands of suppressed ponderosa pine saplings can result in significant benefits to both livestock and wildlife. After 8 years, grasses--mostly pinegrass, a desirable cattle forage--are producing 200 pounds per acre in the unthinned area and from 600 to 900 pounds per acre in the thinned plots. Forbs--mainly

balsamroot, most attractive to deer in early spring--are producing about 370 pounds of herbage in the unthinned plots as compared with 600 to 800 pounds in the thinned plots. Shrubs--primarily bitterbrush, a very important food for deer in fall and winter--supply about 5 pounds of herbage per acre in the unthinned plots and from 75 to 150 pounds in the thinned plots. Optimum production of both wood and forage, with and without utilization of the understory, is yet to be determined from continuing measurements. Similar studies, now underway in ponderosa pine with different understory and in lodgepole pine and mixed conifer species, will extend applicability of results.

Thinning reduces beetle susceptibility

Killing of immature ponderosa pine by the mountain pine beetle is a widespread and rapidly increasing problem in the Pacific Northwest. A study begun in 1965 indicates that regulating stand density, such as by thinning, may be the key to the beetle problem. Stands become susceptible when they first reach maximum basal area, at about age 60-70. Stands of these ages on good sites apparently can carry 150-175 square feet of basal area without serious hazard of infestation; on average sites, 125-150 feet; and on poor sites, 100-125 feet.

Biological control of tussock moth

The Douglas-fir tussock moth is a serious pest of Douglas-fir and true fir forests of the West. Because of the possible hazards of chemical control, a biological alternative is urgently needed. Nucleopolyhedrosis virus attacking the

tussock moth appears to be the most promising agent for biological control. Methods for mass production of the virus have been developed, and a contract has been let for production of sufficient virus for experimental operational-type testing. Toxicological testing is being carried out to satisfy Food and Drug Administration requirements. Virus spray formulations have been greatly improved. Operational-type testing will be carried out on the next suitable outbreak of the tussock moth.

Sterile males may control pine shoot moth

Can the European pine shoot moth be eliminated from the Puget Sound area? Is the sterile-male technique a feasible eradication or control method? The answer to these questions should be revealed by tests involving the release of large numbers of sterilized males in the near future. The first need, methods for producing shoot moths in quantity for large-scale tests, has been resolved by joint efforts of Washington State and Station entomologists. This step is an important one toward production-by-the-millions that will be necessary if eradication or control operations are subsequently to be conducted.

Estimating percentage of defect

Conks of heart rot fungi, basal injuries, frost cracks, and dead or broken tops are useful indicators of defect when related to tree diameter and age. Defect in grand fir, Engelmann spruce, Douglas-fir, and western larch in the Blue Mountains can be estimated from the tables, graphs, or equations provided in a new publication. Forest managers can use the information for determining net sound volumes in trees or

stands and for setting logging priorities. Similar studies are being conducted in other areas of the Pacific Northwest.

Indirect attack on *Poria weirii*

Red alder, whose reputation as a "weed" species is mitigated by its ability to improve soil fertility by nitrogen-fixing root nodules, may also prove a valuable ally in biological control of root diseases such as *Poria weirii*. When grown in pure stands or in mixture with conifers, alder can change several soil properties to the detriment of many root pathogens. The soil's content of nitrate nitrogen, in particular, is radically increased. Although *Poria weirii* and several other serious pathogens lack the enzyme system needed to assimilate nitrate, many antibiotic-producing microbes thrive on it. These microbes, which multiply under alder, can likely suppress growth and even survival of *Poria weirii* in the soil.

Regional resource analyses

Increasing emphasis by both public and private agencies on long-range regional planning has made heavy demands upon the Forest Survey data bank and the talents and skills of its staff. This year two detailed analyses of timber resources and timber industries were completed, one each for the interagency planning committees of the Willamette River basin and the Puget Sound and adjacent water basin. Predictions are that, by the year 2020, pulp and paper mills in the Puget Sound basin will become the dominant consumers of wood, followed by lumber mills. In the Willamette River basin, plywood and veneer plants are expected to be the principal wood consumers, followed by pulp and paper mills.

Total consumption of wood is projected to increase in the Puget Sound basin and decrease in the Willamette River basin. Lumber as a wood product is expected to decline in importance while specialty and fiber products increase. Continued improvements in technology are expected to reduce total employment in all the wood-using industries. Total direct employment in the wood products industries in the Willamette basin is projected to fall by some 14,600 persons or 37 percent by the year 2020, and by about 2,800 persons or 9 percent in the Puget basin in the same period.

Growth projection method proves sound

A recently developed stand table growth projection method, known as TRAS, is proving very useful for updating Forest Survey statistics, predicting the future long-range timber supply in relation to the expected demand, and exploring various timber management alternatives. Long-range projections, of course, are always hazardous because of the difficulty of predicting future growth and mortality rates. However, within the limits of the assumptions about these rates, the growth-projection procedure provides a fast and useful method of estimating future growth and growing stock.

Aerial photos for surveying insect damage

A new aerial techniques manual is being printed in "how-to-do-it" form and covers two basic kinds of surveys: sampling, to estimate total insect damage over large areas, and complete inventory, for orienting salvage and control operations. Procedures for combining photo interpretation estimates and field checks are explained in detail and illustrated with a

numerical example. Guides are given for estimating the number of photo and field plots to achieve a desired sampling error and for tailoring an inventory to a limited budget. Illustrations include color as well as black and white stereograms.

Public timber management planning

National Forests are currently the region's major source of timber, and National Forest decision makers must be knowledgeable of consequences of various decisions regarding forest land resource use.

Mindful of the continuing need to update decision-making capabilities, the production economics staff, in cooperation with Region 6 timber management division, recently started a study of timber management planning systems. The basic objective of this study--code-named "TIMADS"--is to develop mathematical models and computer programs by which decision makers can more efficiently and effectively analyze timber management alternatives. An example is the ARVOL computer program for calculating allowable cut using the area-volume check method. This program reduces to minutes on a computer a job requiring several weeks by desk calculator.

Although designed for analyzing National Forest management alternatives, the source program listing and user's manual is available to any public and private forest land management agency on request.

Quarterly industry report a favorite

A quarterly report of forest products marketing information is published in "Production, Prices, Employment, and Trade in Pacific Northwest Forest Industries." Log export data have been of particular interest recently. Log exports from Washington and Oregon totaled 1,109 million board feet in 1966, 23.1 percent more than total shipments in 1965.

Japan was the destination of 1,023 million board feet, which was a 32-percent increase compared with 1965. In contrast, log exports to Canada were 59 million board feet in 1966, a decline of 52 percent from the 1965 volume.

The average value of log exports for 1966 was \$82.84 compared with \$78.17 for 1965.

Progress on aerial logging systems

Forest engineering research efforts in developing advanced systems of harvesting timber from difficult access areas included further analysis and testing of skyline and balloon logging systems. An instrumented logging balloon was used to obtain continuous readings of balloon dynamics and line loads which occurred during logging. An operational test of a balloon logging system is underway at Deception Creek on the Willamette National Forest. Research for better utilization of skyline systems included preparing an expanded edition of "Skyline Logging Handbook on Wire Rope Tensions and Deflections" and performing background research for a publication on guidelines for layout and design of skyline cutting units.

Tree grades for inland Douglas-fir

A new system for estimating the value of inland Douglas-fir sawtimber simplifies and improves the accuracy of the timber cruising job and also facilitates the computing of the cruise data. The system predicts the value of inland Douglas-fir timber when processed into lumber. Additional research is now being carried out to expand the use of this system to other western softwood species and also to predict the value of timber for veneer and other end products.

Lumber and veneer yield for coast Douglas-fir

This research is providing new information on the yield of veneer and lumber from coast Douglas-fir. Tree and log yield information was collected from a number of sawmills and veneer plants throughout Washington, Oregon, and northern California. The preliminary unpublished data are being used already by timber sellers and purchasers in appraising the value of standing timber, and by wood processing plants for allocating logs to their most profitable use.

Next, this study will consider ways of improving the log grading system now used for coast Douglas-fir timber.

Moisture content of glulam members

A field study was begun to determine the moisture content of heavy structural members under varied service conditions--of special interest to designers in improving structural efficiency, durability, and

design. This program is being conducted by the Station's wood construction project in Seattle, in cooperation with the Forest Products Laboratory, which has initiated a survey of national scope.

The study uses a 3/4-inch-long moisture sensor, developed by the Laboratory. The sensor can be inserted in a 3/16-inch hole to any desired depth and at any point in a structural member. The system may be left in place for months or years to determine seasonal or other cyclic variations in moisture content of structural members in gymnasiums, pools, skating rinks, and food processing and freezer plants.

Regional data from this and other areas of the United States will be analyzed at the Laboratory.

KEY PERSONNEL CHANGES

Dr. Thomas W. Childs was designated principal scientist and special consultant and assigned to interpret, and help put into practice, 35 years of research by himself and others.

Dr. Keith R. Shea, formerly with Weyerhaeuser Co.'s research staff, was employed as project leader for the Station's research on diseases reducing forest production.

Dr. Richard E. Miller transferred to the Olympia field unit in early December as leader of the Douglas-fir silviculture project. He replaces **Norman E. Worthington** who retired late in 1965. Miller was promoted from the Station's field unit at Roseburg, where he has been doing research on regeneration problems in southwestern Oregon. His specialty is

forest soils and his research at Olympia will include studies in Douglas-fir nutrition and use of fertilizers.

H. Gyde Lund joined the Pacific Northwest Station staff during August as photogrammetrist for the fuel appraisal project in Seattle. Lund came to the project from Juneau, Alaska, where he had been on the Forest Survey project of the Northern Forest Experiment Station since 1964.

Hubert D. Burke joined the Pacific Northwest Station staff at Wenatchee in July as principal recreation specialist. Burke came to the Northwest from Fort Collins, Colorado, where he had been in recreation research with the Rocky Mountain Station. He is heading up current research on impacts of use on wilderness.

UPGRADING OUR FACILITIES

Start of construction of the **Silviculture and Animal Problems Laboratory** near Olympia during November 1966 culminated several years of planning by the Station and key cooperators. This \$460,000 facility is located adjacent to the Webster Forest Nursery on a 10-acre site which has been leased to the Forest Service by the Washington State Department of Natural Resources. When completed in the fall of 1967, the laboratory will provide modern research facilities for the Douglas-fir silviculture project and for scientists of both the U.S. Forest Service and the U.S. Bureau of Sport Fisheries and Wildlife who are studying control of animal damage to forest crops.

Portland headquarters for the Pacific Northwest Forest and Range Experiment Station provides for offices of the Director and his five assistants. This function is further complicated by a full headquarters complement for the Research Support Services group and entire or partial complements for some research projects under each of the other four organizational groups. The Omark Building has been headquarters for a number of years. When the Regional Office of the Forest Service

moved to another area, the Station took the opportunity to expand into some of the vacated space and to remodel the space to better fit our needs. The remodeling has featured wood at its finest--Northwest woods--to substantiate that "we believe what we say."

Fuller realization of the potential opportunity for research at **The Forestry Sciences Laboratory** in Corvallis, Oregon, is near as a \$2,500,000 expansion of the facility is being planned. With specifications of needs furnished by the research staff, the Station's own architectural staff is now finalizing the design and engineering phases. The prospectus has been completed; contract documents should be ready by June 1967.

At La Grande, Oregon, planning of the **Range and Wildlife Habitat Laboratory** on the Eastern Oregon College campus was initiated in September 1966. The prospectus for the \$350,000 structure has been approved and diagrammatic drawings are near completion by our staff architects. The Oregon State Board of Higher Education has signed the lease for 4 acres of desirable campus property to be made available for the structure. Plans will be completed in April 1967.

AN ANNOTATED LIST OF PUBLICATIONS
OF THE
PACIFIC NORTHWEST
FOREST AND RANGE EXPERIMENT STATION

THIS IS A LIST OF ALL PUBLICATIONS BY STATION STAFF AND CO-OPERATORS DURING THE YEAR 1966, INCLUDING PUBLISHED TALKS AND ADDRESSES. (FEDERAL, STATE, OR PRIVATE COOPERATORS ARE INDICATED BY AN ASTERISK.) AVAILABLE PUBLICATIONS MAY BE ORDERED BY THE FIVE-DIGIT NUMBER AT THE END OF AUTHOR LINE.

=====

ADAMS, THOMAS C. 7 66054
LOG AND LUMBER EXPORTS.

IN 'CAPSULE FORESTRY.' SOC. AMER. FOREST., PP. 37-39.
(1966) (NO COPIES AVAILABLE)

ONE OF A WEEKLY SERIES OF TALKS PRESENTED ON RADIO
STATION KWJJ, PORTLAND, OREG.

AHO, PAUL E. 7 66060
DEFECT ESTIMATION FOR GRAND FIR, ENGELMANN SPRUCE, DOUGLAS-
FIR, AND WESTERN LARCH IN THE BLUE MOUNTAINS OF OREGON AND
WASHINGTON.

U.S. FOREST SERV. PACIFIC NORTHWEST FOREST AND RANGE EXP.
STA., 26 PP., ILLUS.

GIVES TABLES OF DEFECT PERCENTAGES, FOR CUBIC- AND
BOARD-FOOT VOLUMES, BY CERTAIN TREE CHARACTERISTICS AND
VARIOUS INDICATOR CLASSES. MULTIPLE REGRESSION EQUA-
TIONS USED TO DEVELOP THE TABLES AND A METHOD FOR MAKING
DEFECT ESTIMATES IN MERCHANTABLE GRAND FIR ON A STAND
BASIS ARE ALSO PRESENTED.

BARRETT, JAMES W. 9 66071
QUICK LOG HOOK, RELEASE WITH DOUBLE TONG SYSTEM.
FOREST IND. 93(10), 58-59, ILLUS.

DESCRIBES UNIQUE TRACTOR SKIDDING EQUIPMENT AND LOGGING
METHODS USED ON AN EXPERIMENTAL FOREST TIMBER SALE.
EFFICIENT LOG PRODUCTION IN OLD-GROWTH PONDEROSA PINE
WAS ACHIEVED WITH MINIMUM DAMAGE TO REPRODUCTION.

BARRETT, JAMES W. 4 66032
A RECORD OF PONDEROSA PINE SEED FLIGHT.

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REPORTS ON 1958 DISSEMINATION OF PONDEROSA PINE SEED
INTO A 65-ACRE TRACT, BARE OF OVERSTORY, IN CENTRAL
OREGON.

BEUTER, JOHN H.

1 66008

AN OPTIMUM PRICING STUMPAGE APPRAISAL PROGRAM.

IBM SEMINAR OPER. RES. IN FOREST PROD. IND. PROC.

1965, 66-82, ILLUS. (NO COPIES AVAILABLE)

THIS PAPER DISCUSSES THE CONCEPT AND DESCRIBES THE TECHNIQUE OF APPRAISING STUMPAGE WHEN SEVERAL ENDPRODUCTS ARE CONSIDERED AS USES FOR THE STUMPAGE. A COMPUTER PROGRAM HAS BEEN DEVELOPED TO CALCULATE ALL POSSIBLE APPRAISED VALUES IN A MARKET WITH 'N' PRODUCTION POSSIBILITIES. THE COMPUTERIZED APPRAISAL MODEL CAN BE USED BY APPRAISERS AS A FRAMEWORK FOR MARKET ANALYSES AND APPRAISAL. IT CAN BE USED BY INDUSTRY AS A TOOL FOR EVALUATING SHORT-RUN, LOG-USE STRATEGY.

*BOLLEN, W. B., AND LU, K. C.

5 66035

'SOUR' SAWDUST MULCH MAY DAMAGE ORNAMENTALS.

OREG. ORNAMENTAL AND NURSERY DIGEST 10(1), 2, ILLUS.

(NO COPIES AVAILABLE)

HIGHLY ACID SAWDUST, CHARACTERIZED BY DARK COLOR TOGETHER WITH A PUNGENT, PENETRATING ODOR, SHOULD NOT BE USED AS A SOIL CONDITIONER BECAUSE OF ITS ADVERSE EFFECT ON PLANTS.

BRIEGLEB, PHILIP A.

7 66056

THE SOCIETY OF AMERICAN FORESTERS.

IN 'CAPSULE FORESTRY.' SOC. AMER. FOREST., P. 2. (1966)

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ONE OF A WEEKLY SERIES OF TALKS PRESENTED ON RADIO STATION KWJJ, PORTLAND, OREG.

*BUFFAM, PAUL E., AND CAROLIN, V. M., JR.

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DETERMINING TRENDS IN WESTERN SPRUCE BUDWORM EGG POPULATIONS.

J. ECON. ENTOMOL. 59, 1442-1444. (NO COPIES AVAILABLE)

ANALYSIS OF DATA OBTAINED FROM SURVEYS OF EGG POPULATIONS SHOWED THE RELIABILITY OF A SHORT-CUT METHOD TO MEASURE TREND. IN THE DRY AREAS OF THE PACIFIC COAST STATES, TRENDS CAN BE DETERMINED WITH ONLY 1 YEAR'S SAMPLING BY USING OLD EGG MASSES TO REPRESENT THE PREVIOUS YEAR'S NEW EGG MASSES.

BURCH, WILLIAM R., JR.

9 66076

WILDERNESS--THE LIFE CYCLE AND FOREST RECREATIONAL CHOICE.

J. FOREST. 64, 606-610, ILLUS.

ESTABLISHES THAT NONE OF THE PRINCIPAL FOREST-RELATED RECREATION ACTIVITIES REPRESENTS A 'MAJORITY VOTE' OF THE AMERICAN PEOPLE. STAGES OF FAMILY LIFE WERE RELATED TO EASE OF ACCESS TO CAMPGROUNDS--ALL FOREST RECREATION ACTIVITIES APPEARED TO BE UNAPPEALING TO MOST ELDERLY CITIZENS.

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- *CHANDRA, P., AND *BOLLEN, W. B. 9 66067
 GIBREL--EFFECT ON DECOMPOSITION OF PLANT MATERIALS.
 SCIENCE 153, 1663-1664. (NO COPIES AVAILABLE)
 GIBREL, A POTASSIUM SALT OF GIBBERELIC ACID, ENHANCED
 BIOLOGIC DECOMPOSITION OF MATERIALS CONTAINING CELLULOSE
 AND LIGNINS.
- CHAPPELLE, DANIEL E. 11 66083
 A COMPUTER PROGRAM FOR CALCULATING ALLOWABLE CUT USING THE
 AREA-VOLUME CHECK METHOD.
 U.S. FOREST SERV. RES. NOTE PNW-44, 4 PP.
 DESCRIBES A COMPUTER PROGRAM (CALLED ARVOL) WHICH CALCULATES
 ALLOWABLE CUT BY THE AREA-VOLUME CHECK METHOD.
 THE PROGRAM IS CODED IN FORTRAN IV FOR AN IBM 7040
 INSTALLATION.
- CHAPPELLE, DANIEL E. 5 66039
 ECONOMIC MODEL BUILDING AND COMPUTERS IN FORESTRY RESEARCH.
 J. FOREST. 64, 329-333, ILLUS.
 OUTLINES THE STEPS IN THE MODEL BUILDING PROCESS AND THE
 ROLE THAT DATA PROCESSING EQUIPMENT CAN PLAY IN THE
 PROCESS.
- CHILDS, T. W., AND *WILCOX, EARLE R. 4 66027
 DWARFMISTLETOE EFFECTS IN MATURE PONDEROSA PINE FORESTS IN
 SOUTH-CENTRAL OREGON.
 J. FOREST. 64, 246-250.
 REDUCTIONS IN GROWTH RATES AND INCREASES IN MORTALITY
 RATES ARE ROUGHLY PROPORTIONAL TO INTENSITY OF INFECTION
 AND ARE GREATER THAN EFFECTS ON CROWN CONDITION AS
 RATED BY KEEN'S SYSTEM.
- CRAMER, OWEN P. 7 66058
 WEATHER AND FIRE CONTROL.
 IN 'CAPSULE FORESTRY.' SOC. AMER. FOREST., PP. 81-82.
 (1966) (NO COPIES AVAILABLE)
 ONE OF A WEEKLY SERIES OF TALKS PRESENTED ON RADIO
 STATION KWJJ, PORTLAND, OREG.
- CURTIS, ROBERT O. 4 66029
 A COMPARISON OF SITE CURVES FOR DOUGLAS-FIR.
 U.S. FOREST SERV. RES. NOTE PNW-37, 8 PP., ILLUS.
 NEW SITE CURVES PREPARED BY JAMES KING OF WEYERHAEUSER
 CO., COMPARED WITH STANDARD CURVES, GAVE BETTER ESTI-
 MATES OF SITE INDEX. RESULTS SUGGEST THAT THE STANDARD
 CURVES MAY UNDERESTIMATE SITE INDEX IN YOUNG STANDS.
- CURTIS, ROBERT O. 7 66051
 A FORMULA FOR THE DOUGLAS-FIR TOTAL CUBIC-FOOT VOLUME TABLE
 FROM BULLETIN 201.
 U.S. FOREST SERV. RES. NOTE PNW-41, 8 PP.
 A FORMULA IS GIVEN FOR USE WITH ELECTRONIC COMPUTERS

WHICH CLOSELY APPROXIMATES THE COMMONLY USED TOTAL CUBIC VOLUME TABLE OF BULLETIN 201. A TABLE OF SOLUTIONS BY 1/10-INCH INTERVALS OF DIAMETER AND 10-FOOT INTERVALS OF HEIGHT IS ALSO GIVEN.

DAHMS, WALTER G.

12 66090

EFFECT OF KIND AND NUMBER OF MEASURED TREE HEIGHTS ON LODGEPOLE PINE SITE-QUALITY ESTIMATES.

U.S. FOREST SERV. RES. PAP. PNW-36, 8 PP.

THIS PAPER EVALUATES SITE-QUALITY ESTIMATES FROM HEIGHTS OF VARIOUS KINDS AND NUMBERS OF TREES FOR LODGEPOLE PINE. BASIS OF COMPARISON WAS PRIMARILY VOLUME-INCREMENT-ESTIMATING CAPACITY OF EACH FORM OF HEIGHT. HEIGHTS OF TALLEST AND OF DOMINANT TREES PROVIDED THE BEST ESTIMATES. INCREASING NUMBER OF TREE HEIGHTS MEASURED ON A GIVEN PLOT INCREASED PRECISION, BUT THE GAIN WAS SMALL.

DAHMS, WALTER G.

3 66022

RELATIONSHIP OF LODGEPOLE PINE VOLUME INCREMENT TO CROWN COMPETITION FACTOR, BASAL AREA, AND SITE INDEX.

FOREST SCI. 12, 74-82, ILLUS.

BASAL AREA AND CCF WERE COMPARED AS DENSITY MEASURES. THE EFFECT OF BASAL AREA WAS NOT SOLELY THAT OF STAND DENSITY. THE EFFECT OF STAND DENSITY WAS BEST SHOWN WITH BASAL AREA AS THE MEASURE OF SITE QUALITY AND CCF AS THE MEASURE OF STAND DENSITY.

DEALY, J. EDWARD.

1 66006

BITTERBRUSH NUTRITION LEVELS UNDER NATURAL AND THINNED PONDEROSA PINE.

U.S. FOREST SERV. RES. NOTE PNW-33, 6 PP., ILLUS.

MID-SEPTEMBER BITTERBRUSH SAMPLES REVEALED SIGNIFICANTLY HIGHER ASH AND N.F.E. (NITROGEN FREE EXTRACT) AND LOWER CRUDE FIBER UNDER A NATURAL PONDEROSA PINE STAND THAN UNDER THINNED SAPLINGS. THERE WERE NO SIGNIFICANT DIFFERENCES BETWEEN 13.2- AND 26.4-FOOT SPACING LEVELS. CRUDE PROTEIN AND CRUDE FAT SHOWED NO SIGNIFICANT DIFFERENCES AMONG TREATMENTS.

DEALY, J. EDWARD.

1 66009

SPOTLIGHTING DEER--POTENTIALS FOR MANAGEMENT IN WESTERN OREGON.

U.S. FOREST SERV. RES. NOTE PNW-32, 8 PP., ILLUS.

SPOTLIGHTING OF COLUMBIAN BLACK-TAILED DEER WAS TESTED AS A SAMPLING TECHNIQUE IN THE H. J. ANDREWS EXPERIMENTAL FOREST ON THE WEST SLOPE OF THE OREGON CASCADES. RESEARCH WAS CONDUCTED FROM MAY THROUGH OCTOBER FOR 2 CONSECUTIVE YEARS.

- DYRNESS, C. T. 12 66101
 ERODIBILITY AND EROSION POTENTIAL OF FOREST WATERSHEDS.
 INT. SYMP. FOREST HYDROL., NAT. SCI. FOUND. ADVANCED SCI.
 SEMINAR PROC 1965, 599-611.
 DISCUSSES FACTORS AFFECTING FOREST SOIL ERODIBILITY,
 THE INFLUENCE OF FIRE, LOGGING, AND ROAD CONSTRUCTION ON
 MEASURED AMOUNTS OF EROSION AND SOIL ERODIBILITY
 CHARACTERISTICS, AND RESEARCH NEEDS IN THIS FIELD.
- DYRNESS, C. T., AND *YOUNGBERG, C. T. 5 66034
 SOIL-VEGETATION RELATIONSHIPS WITHIN THE PONDEROSA PINE TYPE
 IN THE CENTRAL OREGON PUMICE REGION.
 ECOLOGY 47, 122-138, ILLUS.
 SIX PLANT COMMUNITIES WERE IDENTIFIED AND CHARACTERIZED.
 SOILS ARE REGOSOLS DEVELOPED ON AEOLIAN PUMICE DEPOSITS.
 SOIL MORPHOLOGY, MOISTURE DEPLETION RATE, AND FERTILITY
 WERE RELATED TO PLANT COMMUNITY OCCURRENCE.
- EDGREN, JAMES W. 12 66089
 BED DENSITY AND SIZE OF PONDEROSA PINE SEEDLINGS AT THE BEND
 NURSERY.
 TENTH BIEN. WEST. FOREST NURSERY COUNC. MEETING PROC.
 1966, 21-29, ILLUS.
 THINNING TO VARIOUS DENSITIES SIGNIFICANTLY AFFECTED
 STEM DIAMETER AND OVENDRY WEIGHT BUT NOT HEIGHT OR
 TOP-ROOT RATIO. RECOMMENDS DENSITIES FOR WANTED STEM
 DIAMETERS.
- FLORA, DONALD F. 1 66002
 ECONOMIC GUIDES FOR PONDEROSA PINE DWARFMISTLETOE CONTROL IN
 YOUNG STANDS OF THE PACIFIC NORTHWEST.
 U.S. FOREST SERV. RES. PAP. PNW-29, 16 PP., ILLUS.
 THE FOREST MANAGER MUST OFTEN DECIDE WHETHER TO INVEST
 TIME AND EFFORT IN DWARFMISTLETOE CONTROL. THIS STUDY
 PROVIDES ECONOMIC GUIDES FOR THIS DECISION IN THE FORM
 OF COST AND RATE-OF-RETURN ESTIMATING PROCEDURES. IT IS
 BASED ON TIME AND COST STUDIES OF CONTROL OPERATIONS IN
 PONDEROSA PINE IN THE NORTHWEST.
- FLORA, DONALD F. 2 66018
 ECONOMIC GUIDES FOR A METHOD OF PRECOMMERICAL THINNING OF
 PONDEROSA PINE IN THE NORTHWEST.
 U.S. FOREST SERV. RES. PAP. PNW-31, 10 PP., ILLUS.
 COST PER ACRE AND DOLLAR RATE OF RETURN ARE GIVEN
 GRAPHICALLY FOR THINNING IN VARIOUS YOUNG PONDEROSA PINE
 STAND TYPES. APPLICABLE ONLY TO HOLDINGS COMMITTED TO
 EVEN-FLOW MANAGEMENT, THE FIGURES CAN AID IN ASSIGNING
 TREATMENT PRIORITIES.

- FLORA, DONALD F. 4 66026
A METHOD OF FORECASTING RETURNS FROM PONDEROSA PINE DWARF-
MISTLETOE CONTROL.
U.S. FOREST SERV. RES. PAP. PNW-32, 17 PP.
GIVES A DETAILED EXPLANATION OF SIMULATION MODELS USED
IN DEVELOPING TREATMENT PRIORITIES. THE RESULTING FIELD
RATING GUIDES ARE IN U.S. FOREST SERV. RES. PAP. PNW-29,
1966.
- FRANKLIN, JERRY F. 2 66016
INVASION OF SUBALPINE MEADOWS BY ABIES LASIOCARPA IN THE
MOUNT RAINIER AREA. (ABSTR.)
NORTHWEST SCI. 40, 38. (NO COPIES AVAILABLE)
- FRANKLIN, JERRY F. 12 66094
THE TRUE FIR-HEMLOCK FORESTS OF NORTHWESTERN AMERICA AND
THEIR AFFINITIES WITH THE HIGH-ELEVATION FORESTS OF JAPAN.
(ABSTR.)
ELEVENTH PACIFIC SCI. CONGR. PROC., VOL. 5, DIV. MEETING
PLANT AND ANIMAL ECOL., P. 6. (NO COPIES AVAILABLE)
- FURNISS, ROBERT L. 7 66050
FOREST INSECTS.
IN 'CAPSULE FORESTRY.' SOC. AMER. FOREST., PP. 83-84.
(1966) (NO COPIES AVAILABLE.)
ONE OF A WEEKLY SERIES OF TALKS PRESENTED ON RADIO
STATION KWJJ, PORTLAND, OREG.
- FURNISS, ROBERT L. 7 66047
WHAT DOES THE FUTURE HOLD IN FOREST INSECT CONTROL.
WEST. FOREST. CONF. PROC. 1965, 45-48.
DISCUSSES HOW, AS FOREST MANAGEMENT IS INTENSIFIED,
INSECT PROBLEMS WILL CHANGE AND WILL REQUIRE INCREASED
ATTENTION. NOTABLE PROGRESS IS BEING MADE ON THE TECH-
NIQUES OF INSECT CONTROL. THESE TECHNIQUES WILL BE
FULLY EFFECTIVE ONLY WHEN APPLIED IN HARMONY WITH FOREST
MANAGEMENT OBJECTIVES.
- GARRISON, GEORGE A. 12 66093
A PRELIMINARY STUDY OF RESPONSE OF PLANT RESERVES TO SYSTEMS
AND INTENSITIES OF GRAZING ON MOUNTAIN RANGELAND IN NORTH-
WEST U.S.A.
TENTH INT. GRASSLAND CONGR. PROC. 1966. PAPERBACK ED.,
PP. 125-128. HARD COVER ED., PP. 937-940.
THERE WAS A GREATER PERCENT OF CARBOHYDRATE RESERVES
WITH LIGHT AND MODERATE STOCKING THAN UNDER HEAVY
STOCKING. ALSO, THERE WAS A TENDENCY FOR CARBOHYDRATE
ACCUMULATION TO BE GREATER WITH DEFERRED-ROTATION
GRAZING THAN WITH SEASON-LONG SYSTEM.

GEDNEY, DONALD R., NEWPORT, CARL A., AND *HAIR, DWIGHT. 3 66024
PROSPECTIVE ECONOMIC DEVELOPMENTS BASED ON THE TIMBER
RESOURCES OF THE PACIFIC NORTHWEST.

PACIFIC NORTHWEST ECONOMIC BASE STUDY FOR POWER MARKETS,
V. II, PT. 6. FOREST INDUSTRIES, 174 PP., ILLUS.

(COOPERATIVELY PUBLISHED WITH BONNEVILLE POWER ADMIN.)
CONTAINS AN APPRAISAL OF THE PRESENT AND FUTURE FOREST
RESOURCES, FOREST INDUSTRIES, AND FOREST EMPLOYMENT,
BASED ON AN ANALYSIS OF THE NATION'S TIMBER SITUATION
AND AN ALLOCATION OF ESTIMATED FUTURE NATIONAL DEMAND TO
THE PACIFIC NORTHWEST.

*GERLOFF, G. C., MOORE, D. G., AND *CURTIS, J. T. 12 66099
SELECTIVE ABSORPTION OF MINERAL ELEMENTS BY NATIVE PLANTS
OF WISCONSIN.

PLANT AND SOIL 25(3), 393-405. (NO COPIES AVAILABLE)
NATIVE PLANTS OF WISCONSIN APPEAR TO BE SELECTIVE IN
ABSORBING MINERAL ELEMENTS. SOME OF THE NUTRITIONAL
AND ECOLOGICAL IMPLICATIONS ARE DISCUSSED.

*GESSEL, S. P., *COLE, D. W., AND *RIEKERK, H. 7 66049
TECHNIQUES AND PRELIMINARY DATA OF THE MOVEMENT OF DDT AND
ZECTRAN THROUGH A FOREST SOIL. (ABSTR.)

AMER. SOC. AGRON., AGRON. ABSTR. 1966, 94.
(NO COPIES AVAILABLE)

NEITHER DDT, APPLIED TO THE FOREST FLOOR AT RATES OF
0.5 AND 5.0 POUNDS PER ACRE, NOR ZECTRAN, AT 0.01
POUND PER ACRE, SHOWED APPRECIABLE DOWNWARD MOVEMENT
OVER 1 YEAR'S TIME.

GOEBEL, CARL J. 2 66011
EFFECT OF HERBICIDES ON SEEDLING DEVELOPMENT IN AN IOWA
CONIFER PLANTATION.

IOWA STATE J. SCI. 40(3), 303-314, ILLUS. (NO COPIES
AVAILABLE)

FOUR PREPLANTING HERBICIDES IN SPRAY FORM, THREE POST-
PLANTING TREATMENTS WITH GRANULAR HERBICIDE, AND MACHINE
CULTIVATION WERE COMPARED ON A PLANTATION SITE.

COMBINATIONS OF HERBICIDES USED AT PROPER TIME AND IN
RECOMMENDED DOSAGES CONTROLLED WEEDS WITH NO MEASURABLE
ADVERSE EFFECT ON CONIFER TREE SEEDLINGS.

GRANTHAM, JOHN. 11 66080

ADDRESS. SHOULD MARKET DEMAND ALONE DETERMINE WOODS
UTILIZATION. IN 'LOGGERS HANDBOOK,' VOL. 26. SECT. II,
56TH SESS. PACIFIC LOGGING CONGR. PROC. 1965, 16-21,
ILLUS. (NO COPIES AVAILABLE)

DISCUSSES THE QUESTION OF HOW LOGGING OVERMATURE STANDS
CAN BE CHANGED FROM REMOVAL OF THOSE LOGS THAT PAY THEIR
WAY TO A BETTER LAND MANAGEMENT PRACTICE. RESIDUES FROM
OVERMATURE TIMBER STANDS ARE SHOWN AND THE COSTS VERSUS
BENEFITS OF SUCH RESIDUE REMOVAL ARE CONSIDERED.

- HAMILTON, THOMAS E. 3 66023
 PRODUCTION, PRICES, EMPLOYMENT, AND TRADE IN PACIFIC NORTH-
 WEST FOREST INDUSTRIES, FOURTH QUARTER 1965. 20 PP., ILLUS.
 PROVIDES CURRENT INFORMATION ON LUMBER AND PLYWOOD
 PRODUCTION AND PRICES, EMPLOYMENT IN THE FOREST
 INDUSTRIES, INTERNATIONAL TRADE IN LOGS AND LUMBER,
 VOLUME AND AVERAGE PRICES OF STUMPAGE SOLD BY PUBLIC
 AGENCIES, AND OTHER RELATED ITEMS.
- HAMILTON, THOMAS E. 6 66041
 PRODUCTION, PRICES, EMPLOYMENT, AND TRADE IN PACIFIC NORTH-
 WEST FOREST INDUSTRIES, FIRST QUARTER 1966.
 18 PP., ILLUS.
 PROVIDES CURRENT INFORMATION ON LUMBER AND PLYWOOD
 PRODUCTION AND PRICES, EMPLOYMENT IN THE FOREST INDUS-
 TRIES, INTERNATIONAL TRADE IN LOGS AND LUMBER, VOLUME
 AND AVERAGE PRICES OF STUMPAGE SOLD BY PUBLIC AGENCIES,
 AND OTHER RELATED ITEMS.
- HAMILTON, THOMAS E. 9 66073
 PRODUCTION, PRICES, EMPLOYMENT, AND TRADE IN PACIFIC NORTH-
 WEST FOREST INDUSTRIES, SECOND QUARTER 1966.
 21 PP., ILLUS.
 PROVIDES CURRENT INFORMATION ON LUMBER AND PLYWOOD
 PRODUCTION AND PRICES, EMPLOYMENT IN THE FOREST INDUS-
 TRIES, INTERNATIONAL TRADE IN LOGS AND LUMBER, VOLUME
 AND AVERAGE PRICES OF STUMPAGE SOLD BY PUBLIC AGENCIES,
 AND OTHER RELATED ITEMS.
- HAMILTON, THOMAS E. 11 66081
 PRODUCTION, PRICES, EMPLOYMENT, AND TRADE IN PACIFIC NORTH-
 WEST FOREST INDUSTRIES, THIRD QUARTER 1966.
 19 PP., ILLUS.
 PROVIDES CURRENT INFORMATION ON LUMBER AND PLYWOOD
 PRODUCTION AND PRICES, EMPLOYMENT IN THE FOREST INDUS-
 TRIES, INTERNATIONAL TRADE IN LOGS AND LUMBER, VOLUME
 AND AVERAGE PRICES OF STUMPAGE SOLD BY PUBLIC AGENCIES,
 AND OTHER RELATED ITEMS.
- HARRIS, ROBERT W. 7 66061
 CAREERS IN WATERSHED MANAGEMENT RESEARCH.
 IN 'CAREER OPPORTUNITIES IN WATER RESOURCES.' OREG. STATE
 UNIV. WATER RESOURCES RES. INST. SEMINAR 1966, 95-98.
 (NO COPIES AVAILABLE)
 RESEARCH IN WATERSHED MANAGEMENT PROBLEMS OF THE PACIFIC
 NORTHWEST IS DONE BY A TEAM OF SCIENTISTS WITH SPECIAL-
 IZED TRAINING IN HYDROLOGY, SOILS, METEOROLOGY, PLANT
 PHYSIOLOGY, ECOLOGY, MICROBIOLOGY, AND FORESTRY. THE
 SCIENTISTS WORK TOGETHER ON SOIL-PLANT-WATER RELATIONS
 PROBLEMS.

- HARVEY, GEORGE M. 8 66065
AN EVALUATION OF THE BASAL STEM APPLICATION OF ACTI-DIONE
AND PHYTOACTIN FOR CONTROL OF WHITE PINE BLISTER RUST ON
SUGAR PINE IN OREGON AND CALIFORNIA.
PLANT DIS. REP. 50, 554-556.
BASAL STEM APPLICATIONS OF CYCLOHEXIMIDE AND PHYTOACTIN
IN FUEL OIL FAILED TO CONTROL WHITE PINE BLISTER RUST
CANKERS ON SUGAR PINE IN SOUTHWESTERN OREGON AND
NORTHERN CALIFORNIA.
- HENDEE, JOHN. 12 66092
AN EVALUATION OF THE NORTH CASCADES STUDY REPORT AS A BASIS
FOR DECISION MAKING.
UNIV. WASH. COLL. FOREST. INST. FOREST PROD. CONTEMP.
FOREST PAP., CONTRIB. 2, 12 PP., ILLUS.
MAJOR POINTS INCLUDE--(1) SOME PROPOSED EXPENDITURES
OF FEDERAL FUNDS TO DEVELOP THE NORTH CASCADES,
REFERRED TO AS BENEFITS IN THE STUDY REPORT, WHEN VIEWED
NATIONALLY ARE LARGELY COSTS, (2) BEFORE INCREASED OUT-
OF-STATE TOURIST MONEY CAN PROPERLY BE USED TO SUPPORT A
NEW NATIONAL PARK, THE PORTIONS THAT WOULD BE ATTRACTED
TO THE AREA IN ITS PRESENT CONDITION OR DIVERTED FROM
OTHER ATTRACTIONS MUST BE DEDUCTED, (3) WILDERNESS USE
IS INCREASING FASTER THAN OTHER USES OF THE AREA, AND
JEOPARDIZING THE QUALITY OF THIS RESOURCE MIGHT BE
UNDESIRABLE, (4) NEITHER PARK SERVICE NOR FOREST SERVICE
CAN CLAIM EXCLUSIVE QUALIFICATIONS FOR RECREATION
MANAGEMENT, (5) THE NEED FOR IMMEDIATE DEVELOPMENT OF
THE NORTH CASCADES IS NOT APPARENT IF ALTERNATIVES ARE
FULLY CONSIDERED.
- JOHNSON, FLOYD A. 1 66005
BARK FACTORS FOR DOUGLAS-FIR.
U.S. FOREST SERV. RES. NOTE PNW-34, 3 PP.
PROVIDES A PROCEDURE FOR CONVERTING UPPER STEM OUTSIDE-
BARK TREE DIAMETER AS MEASURED WITH A DENDROMETER TO
INSIDE-BARK DIAMETER.
- KRUEGER, KENNETH W. 12 66097
HIDDEN CHANGES IN DOUGLAS-FIR SEEDLINGS SUGGEST TIMING OF
NURSERY OPERATIONS.
TENTH BIEN. WEST. FOREST NURSERY COUNC. MEETING PROC.
1966, 56-59, ILLUS.
THE SEASONAL FOOD RESERVE AND GROWTH PATTERN ARE
REPORTED AND DISCUSSED AS THEY MIGHT APPLY TO CURRENT
AND POSSIBLE ALTERNATIVE NURSERY PRACTICES.
- LOPUSHINSKY, WILLIAM. 12 66088
TRANSPIRATION OF CONIFER SEEDLINGS IN RELATION TO SOIL
MOISTURE STRESS. (ABSTR.)
PLANT PHYSIOL. PROC. ANNU. MEETINGS 1966. IV.
(NO COPIES AVAILABLE)

TRANSPIRATION RATES OF POTTED PONDEROSA PINE, LODGEPOLE PINE, DOUGLAS-FIR, GRAND FIR, ENGELMANN SPRUCE, AND WESTERN LARCH SEEDLINGS WERE COMPARED AT VARIOUS LEVELS OF SOIL MOISTURE STRESS UNDER CONTROLLED ENVIRONMENTAL CONDITIONS. STUDIES OF STOMATAL SENSITIVITY TO LEAF MOISTURE STRESS WERE ALSO MADE ON TWIGGS OF EACH OF THESE SPECIES.

LYNOTT, ROBERT E.

11 66082

WEATHER AND CLIMATE OF THE COLUMBIA GORGE.

NORTHWEST SCI. 40, 129-132. (NO COPIES AVAILABLE)

THE COLUMBIA GORGE IS A LOW-ELEVATION GATEWAY THROUGH THE CASCADE RANGE. IT PROVIDES A REMARKABLE TRANSITION FROM A MARINE-TYPE CLIMATE TO A CONTINENTAL-TYPE CLIMATE. VIOLENT WEATHER SOMETIMES OCCURS, SUCH AS STRONG WIND, FREEZING RAIN, AND HEAVY SNOW.

LYNOTT, ROBERT E., AND CRAMER, OWEN P.

2 66021

DETAILED ANALYSIS OF THE 1962 COLUMBUS DAY WINDSTORM IN OREGON AND WASHINGTON.

MCN. WEATHER REV. 94(2), 105-117, ILLUS.

THE PACIFIC NORTHWEST'S MOST DESTRUCTIVE WINDSTORM IS ANALYZED IN DETAIL AND COMPARED WITH OTHER NOTABLE WINDSTORMS. THE PRESSURE PATTERN IS USED TO DETERMINE LOCATION AND MAGNITUDE OF MAXIMUM WINDS.

LYSONS, HILTON H.

9 66074

COMPATIBILITY OF BALLOON FABRICS WITH AMMONIA.

U.S. FOREST SERV. RES. NOTE PNW-42, 9 PP., ILLUS.

GIVES RESULTS OF A PRELIMINARY SEARCH FOR A SUITABLE MATERIAL FOR LOGGING BALLOONS WHEN INFLATED WITH AMMONIA INSTEAD OF HELIUM. TESTS SHOWED THAT TYPICAL BALLOON FABRICS WERE UNSUITABLE FOR AMMONIA INFLATION AND INDICATED OTHER DIRECTIONS FOR FURTHER RESEARCH EFFORT.

LYSONS, HILTON H.

3 66025

UNDERSTANDING SKYLINES--ARE THEY PROBLEMS OR PANACEAS.

FOREST IND. 93(3), 60-62, ILLUS.

POINTS OUT THE INHERENT PROPERTIES COMMON TO ALL SKYLINES REGARDLESS OF THE SYSTEM USED FOR LOGGING. ALSO GIVES HELPFUL INFORMATION ON SKYLINE YARDING OPERATIONS.

LYSONS, HILTON H., BINKLEY, VIRGIL W.,
AND MANN, CHARLES N.

2 66013

LOGGING TEST OF A SINGLE-HULL BALLOON.

U.S. FOREST SERV. RES. PAP. PNW-30, 20 PP., ILLUS.

A SINGLE-HULL BALLOON WAS TESTED UNDER ACTUAL LOGGING CONDITIONS TO REVEAL NECESSARY DESIGN REQUIREMENTS AND PROBLEM AREAS AS A BASIS FOR FURTHER DEVELOPMENT OF BALLOON LOGGING.

MCCONNELL, B. R., AND GARRISON, G. A. 1 66007
SEASONAL VARIATIONS OF AVAILABLE CARBOHYDRATES IN BITTER-
BRUSH.

J. WILDLIFE MANAGE. 30, 168-172, ILLUS.

THE PATTERN OF CARBOHYDRATE ACCUMULATION-DEPLETION WAS
DETERMINED FOR TOPS AND ROOTS OF BITTERBRUSH (PURSHIA
TRIDENTATA), AN IMPORTANT BIG-GAME BROWSE PLANT.
SEASONAL TRENDS IN BOTH PERCENT AND WEIGHT OF TOTAL
MOBILIZABLE CARBOHYDRATE COMPOUNDS WERE CYCLIC.

MARTIGNONI, MAURO E., AND *MILSTEAD, JAMES E. 6 66045
HYPOPROTEINEMIA IN A NOCTUID LARVA DURING THE COURSE OF A
GRANULOSIS.

J. INVERTEBRATE PATHOL. 8, 261-263, ILLUS.

A DEFICIT IN BLOOD-PLASMA TOTAL SOLIDS WAS DETECTED BY
MEANS OF REFRACTOMETRY IN LARVAE OF THE VARIEGATED CUT-
WORM, PERIDROMA SAUCIA, FOLLOWING INOCULATION WITH
GRANULOSIS VIRUS. THE DEFICIT IN BLOOD-PLASMA TOTAL
SOLIDS WAS SIGNIFICANT AT THE FOURTH DAY POSTINOCULATION
AND IT INCREASED CONTINUOUSLY TO ITS HIGHEST VALUE AT
THE SIXTH DAY POSTINOCULATION. CERTAIN DIFFERENCES
BETWEEN THE BLOOD-PLASMA TOTAL SOLIDS DEFICITS DURING
THE COURSE OF GRANULOSIS AND OF A NUCLEOPOLYHEDROSIS
ARE DISCUSSED.

*MARTIN, GEORGE C., AND LOPUSHINSKY, WILLIAM. 1 66003
EFFECT OF N-DIMETHYL AMINO-SUCCINAMIC ACID (B-995), A GROWTH
RETARDANT, ON DROUGHT TOLERANCE.

NATURE (LONDON) 209(5019), 216-217.

TREATMENT WITH FOLIAR SPRAYS OF B-995 REDUCED LEAF WATER
DEFICIT AND TRANSPIRATION RATE IN APPLE TREES BUT NOT IN
SUNFLOWER SEEDLINGS. HOWEVER, IN SUNFLOWER, THE TREAT-
MENT ENHANCED THE ABILITY OF THE PLANT TO RECOVER AFTER
SEVERE DROUGHT CONDITIONS.

MINORE, DON. 12 66096
IDENTIFICATION OF ROTTEN LOGS IN THE COASTAL FORESTS OF
OREGON AND WASHINGTON.

PACIFIC NORTHWEST FOREST AND RANGE EXP. STA.,
16 PP., ILLUS.

AN IDENTIFICATION KEY FOR THE ROTTEN LOGS OF SITKA
SPRUCE, WESTERN HEMLOCK, DOUGLAS-FIR, THE TRUE FIRS,
WESTERN REDCEDAR, RED ALDER, AND BIGLEAF MAPLE.
ANATOMICAL CHARACTERISTICS VISIBLE WITH HAND LENS ARE
INCLUDED.

MITCHELL, R. G. 9 66069
AN IMPROVISED TABLE-TYPE MICROPROJECTOR.

ANN. ENTOMOL. SOC. AMER. 59, 1025-1026, ILLUS.

A COMPOUND MICROSCOPE SITS ON A MOVEABLE PLATFORM UNDER
A TABLE WITH A GLASS-COVERED HOLE IN THE TOP, AND
PROJECTS AN IMAGE UPWARD WHERE IT CAN BE TRACED ON

PAPER. THE SYSTEM OVERCOMES SEVERAL OBJECTIONS USUALLY ASSOCIATED WITH IMPROVISED MICROPROJECTORS.

MITCHELL, RUSSEL G. 9 66070
INFESTATION CHARACTERISTICS OF THE BALSAM WOOLLY APHID IN THE PACIFIC NORTHWEST.

U.S. FOREST SERV. RES. PAP. PNW-35, 18 PP., ILLUS.
THE BALSAM WOOLLY APHID IS A SERIOUS ENEMY OF NATIVE AND EXOTIC TRUE FIRS IN OREGON AND WASHINGTON. GRAND, SUBALPINE, AND PACIFIC SILVER FIRS SOMETIMES SUFFER SEVERELY FROM ATTACK. CHARACTERISTICS OF INFESTATIONS DIFFER CONSIDERABLY BETWEEN SPECIES AND IN DIFFERENT ENVIRONMENTS. SOME EXOTICS ARE NOT DAMAGED.

MORRIS, WILLIAM G. 9 66068
GUIDELINES OFFERED FOR SLASH BURNING.
FOREST IND. 93(10), 62-63, ILLUS.

WHETHER SLASH FIRES WEST OF THE CASCADES WILL SPREAD READILY OR NOT CAN BE DETERMINED BY INDICATOR STICK MOISTURE, ASPECT, AND PRESENCE OF DUFF MOISTURE.

*NEAL, J. L., JR., LU, K. C., *BOLLEN, W. B., 7 66052
AND TRAPPE, J. M.

APPARATUS FOR RAPID REPLICA PLATING IN RHIZOSPHERE STUDIES.
APPL. MICROBIOL. 14(4), 695-696, ILLUS.

WITH THIS SIMPLE DEVICE, 25 CULTURES OF MICRO-ORGANISMS CAN BE INOCULATED ON A PETRI PLATE AT ONE TIME FOR DIAGNOSTIC OR PHYSIOLOGICAL STUDIES. THE READILY AVAILABLE PARTS COST LESS THAN \$10.

*NEAL, J. L., JR., LU, K. C., *BOLLEN, W. B., 12 66102
AND TRAPPE, J. M.

TWO SIMPLE TIME-SAVING TECHNIQUES FOR STUDIES OF SOIL MICROBIAL POPULATIONS AND SUBSEQUENT CULTURE CHARACTERIZATION.

INT. SOC. SOIL SCI. COMM. III NEWS BULL. 6, P. 38.
(NO COPIES AVAILABLE)

THROUGH USE OF THESE LOW-COST MATERIALS AND TWO SIMPLE TECHNIQUES, MICROBIAL POPULATIONS CAN BE ESTIMATED AND COLONIES ISOLATED WITH SUBSTANTIAL SAVINGS IN TIME.

*NEAL, J. L., JR., LU, K.C., TRAPPE, J. M., 7 66057
AND *BOLLEN, W. B.

RHIZOSPHERE MICROBIAL ACTIVITY OF MYCORRHIZAL AND NONMYCORRHIZAL ROOTS OF DOUGLAS FIR AND RED ALDER. (ABSTR.)

AMER. SOC. MICROBIOL. BACTERIOL. PROC. 1966, 2, A10..
(NO COPIES AVAILABLE)

MICRO-ORGANISMS WERE MORE ABUNDANT ON ROOT SURFACES OF ALDER THAN OF DOUGLAS-FIR. DIFFERENT KINDS OF MYCORRHIZAE VARIED IN SURFACE POPULATIONS AS WELL. SUCH DIFFERENCES MAY STRONGLY INFLUENCE THE SUSCEPTIBILITY OF ROOTS TO ATTACK BY DISEASE FUNGI.

- NELSON, EARL E. 8 66066
FACTORS AFFECTING SURVIVAL OF PORIA WEIRII IN SMALL, BURIED
CUBES OF DOUGLAS-FIR.
PHYTOPATHOLOGY 56, 892. (ABSTR.) (NO COPIES AVAILABLE)
- NEWPORT, CARL A. 7 66055
DETERMINATION OF A ROTATION.
WEST. FOREST. CONF. PROC. 1965, 99-103.
EXPLAINS THE KEY ROLE OF ROTATION LENGTH IN CONTROLLING
THE LEVEL OF CUTTING AND ECONOMIC ACTIVITY IN THE
PACIFIC NORTHWEST AND HOW SEVERAL BIOLOGICAL AND SOCIAL
FACTORS INFLUENCE THE LENGTH OF ROTATION.
- NEWPORT, CARL. 7 66062
FOREST ECONOMICS.
IN 'CAPSULE FORESTY.' SOC. AMER. FOREST., PP. 36-37.
(1966) (NO COPIES AVAILABLE)
ONE OF A WEEKLY SERIES OF TALKS PRESENTED ON RADIO
STATION KWJJ, PORTLAND, OREG.
- PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STA. 2 66015
RESEARCH SERVES THE NATION.
IN 'THE SIXTIETH YEAR, FOREST SERVICE--1965 IN THE PACIFIC
NORTHWEST.' PACIFIC NORTHWEST REGION AND PACIFIC NORTH-
WEST FOREST AND RANGE EXP. STA. JOINT ANNUAL REPORT 1965,
24-31, ILLUS.
- PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STA. 2 66017
AN ANNOTATED LIST OF PUBLICATIONS OF THE PACIFIC NORTHWEST
FOREST AND RANGE EXPERIMENT STATION FOR YEAR 1965. 18 PP.
- PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STA. 5 66037
DECEPTION CREEK BALLOON LOGGING TEST.
4 PP.(UNNUMBERED), ILLUS.
INFORMATION LEAFLET DESCRIBING BALLOON LOGGING TEST AT
DECEPTION CREEK, FOURTH PHASE IN A SERIES OF ENGINEERING
STUDIES TO DEVELOP A MEANS OF HARVESTING STEEP AND
RUGGED FOREST LAND.
- PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STA. 6 66044
FOREST ENGINEERING RESEARCH.
4 PP.(UNNUMBERED), ILLUS.
A NONTECHNICAL EXPLANATION OF THE GOALS AND RESULTS OF
FOREST ENGINEERING RESEARCH AT THE STATION.
- PHARIS, RICHARD P. 9 66072
COMPARATIVE DROUGHT RESISTANCE OF FIVE CONIFERS AND FOLIAGE
MOISTURE CONTENT AS A VIABILITY INDEX.
ECOLOGY 47, 211-221, ILLUS.
FOLIAGE MOISTURE CONTENT CAN BE USED AS AN INDEX OF THE
SOIL MOISTURE STRESS WITHIN A NARROW RANGE AS WELL AS A
VIABILITY INDEX. USING TWO DIFFERENT TESTS, PONDEROSA

PINE, INCENSE-CEDAR, AND DOUGLAS-FIR WERE FOUND MOST DROUGHT RESISTANT, SUGAR PINE LEAST, AND GRAND FIR INTERMEDIATE.

PHARIS, RICHARD P., AND *FERRELL, WILLIAM K. 12 66084
DIFFERENCES IN DROUGHT RESISTANCE BETWEEN COASTAL AND INLAND SOURCES OF DOUGLAS-FIR.

CAN. J. BOT. 44, 1651-1659, ILLUS.

TWO DROUGHT HARDINESS TESTS AND LETHAL NEEDLE-MOISTURE CONTENT SHOWED SEEDLINGS FROM INLAND SOURCES TO BE MORE RESISTANT. NEEDLE MOISTURE SEEMS A WORKABLE INDEX FOR WHOLE PLANT VIABILITY.

POPE, ROBERT B. 7 66053
PROCESSING INVENTORY DATA.

WEST. FOREST. CONF. PROC. 1965, 16-20, ILLUS.

DESCRIBES AND ILLUSTRATES BY EXAMPLE THE USE OF A FOREST SIMULATION MODEL TO ANALYZE AND INTERPRET FOREST INVENTORY DATA AND TO PREDICT THE LONG-TERM EFFECTS OF ALTERNATIVE MANAGEMENT DECISIONS.

RADWAN, M. A. 7 66048

ABSORPTION AND DISTRIBUTION OF C14-LABELED TETRAMINE IN RELATION TO ITS POSSIBLE USE IN ANIMAL DAMAGE CONTROL.

U.S. FOREST SERV. RES. PAP. PNW-34, 16 PP., ILLUS.

PATTERNS OF ABSORPTION, TRANSLOCATION, AND MOBILITY OF TETRAMINE IN THREE PLANT SPECIES POINT TO SERIOUS LIMITATIONS TO THE CHEMICAL'S USE TO PROTECT DOUGLAS-FIR SEEDLINGS FROM ANIMALS.

RADWAN, M. A. 5 66036

UPTAKE, DISTRIBUTION, AND METABOLIC FATE OF RADIOACTIVE TETRAMINE IN THREE PLANT SPECIES. (ABSTR.)

WEST. FOREST GENETICS ASS. PROC. 1965, 69.

*RICARD, JACQUES L., AND *BOLLEN, W. B. 12 66087

ROLE OF PORIA CARBONICA IN THE DETERIORATION OF DOUGLAS FIR HEARTWOOD. (ABSTR.)

AMER. SOC. MICROBIOL. BACTERIOL. PROC. 1966, 6, A29.
(NO COPIES AVAILABLE)

DOUGLAS-FIR HEARTWOOD MAY DISINTEGRATE IN LESS THAN 18 MONTHS AFTER INOCULATION WITH PORIA CARBONICA.

ROTHACHER, JACK. 4 66031

EXPERIMENTAL WATERSHEDS USED AS A RESEARCH TOOL BY THE FOREST SERVICE.

IN 'NOTES ON UNIT SOURCE WATERSHED CONFERENCE.' U.S. AGR. RES. SERV., SOIL AND WATER CONSERV. RES. DIV., PP. 1-16 (APPENDIX H), ILLUS.

EXPERIMENTAL WATERSHEDS ARE THE TRADITIONAL APPROACH TO STUDY OF THE EFFECT OF LAND TREATMENT ON STREAMFLOW AND SEDIMENTATION. IN SPITE OF EMPHASIS ON MORE BASIC

RESEARCH AND THE USE OF MODERN RESEARCH TECHNIQUES, WATERSHEDS STILL PLAY AN IMPORTANT PART IN THE FOREST SERVICE'S WATERSHED MANAGEMENT RESEARCH PROGRAM. OVER 250 GAGED WATERSHEDS ARE LISTED.

SCHMIDT, FRED H. 10 66079

TWO ARTIFICIAL (OLIGIDIC) MEDIA FOR THE DOUGLAS-FIR BEETLE, DENDROCTONUS PSEUDOTSUGAE HOPKINS (COLEOPTERA, SCOLYTIDAE).

CAN. ENTOMOL. 98, 1050-1055.

UNDER XENIC CONDITIONS, 75.2 PERCENT OF NEWLY HATCHED LARVAE DEVELOPED TO THE ADULT STAGE IN ONE MEDIUM AND 41.7 PERCENT IN THE OTHER. IMMATURE BEETLES APPEAR TO BE TOLERANT OF CONSIDERABLE VARIATION IN PH, PHYSICAL CONSISTENCY, AND PALATABILITY OF FOOD MATERIAL BUT ARE RELATIVELY SENSITIVE TO MOISTURE LEVELS.

SILEN, ROY R. 12 66086

A SIMPLE, PROGRESSIVE, TREE IMPROVEMENT PROGRAM FOR DOUGLAS-FIR.

U.S. FOREST SERV. RES. NOTE PNW-45, 13 PP.

ALMOST CERTAIN GENETIC IMPROVEMENT IN SEED FOR COMMERCIAL PLANTING ARISES FROM PROGENY TEST RESULTS OF 300 WIND-POLLINATED, ROADSIDE TREES FROM WHICH THE BEST 75 PARENTS ARE SELECTED IMMEDIATELY AND CAN BE RECHOSEN AT 5, 10, 15, ETC., YEARS.

SILEN, ROY R. 5 66038

A 50-YEAR RACIAL STUDY OF DOUGLAS-FIR IN WESTERN OREGON AND WASHINGTON. (ABSTR.)

WEST. FOREST GENETICS ASS. PROC. 1965, 6-7.

SORENSEN, FRANK. 6 66040

INHERITANCE OF COTYLEDON NUMBER IN DOUGLAS-FIR.

FOREST SCI. 12, 175-176.

INTRASPECIFIC CROSSES WERE MADE USING FIVE DIFFERENT POLLEN MIXES ON THE SAME PSEUDOTSUGA MENZIESII SEED TREE. AT GERMINATION, IT WAS FOUND THAT AVERAGE COTYLEDON NUMBERS OF THE PROGENIES COULD BE USED TO VERIFY SEVERAL HYBRID PARENTAGES EVEN THOUGH AVERAGE NUMBERS DIFFERED BY ONE COTYLEDON OR LESS.

STEEN, HAROLD K. 8 66063

VEGETATION FOLLOWING SLASH FIRES IN ONE WESTERN OREGON LOCALITY.

NORTHWEST SCI. 40, 113-120, ILLUS.

GIVES 16-YEAR TRENDS OF INCREASE IN CONIFER REPRODUCTION, BRUSH, AND HERBS AND FINAL PROPORTIONS OF DIFFERENT COVER SPECIES ON 13 PAIRS OF BURNED AND UNBURNED SLASH PLOTS.

STEIN, WILLIAM I.

10 66078

A NEW LOOK AT SEEDSPOTTING.

BRIT. COLUMBIA REFOREST. BOARD TREE FARM FORESTRY COMM.,
1966 REFOREST. WORKSHOP PROC., 9 PP.

BRIEFLY DESCRIBES WESTERN SEEDSPOTTING TRIALS DURING THE
PAST HALF CENTURY AS A PRELUDE TO DEFINING CONDITIONS
WHERE SEEDSPOTTING IS PREFERABLE TO BROADCAST SEEDING.
RECOMMENDS THAT SEEDSPOTTING BE PRACTICED IN THOSE
SITUATIONS WHERE SOIL SURFACE CONDITIONS, TYPE OF SOIL,
LOCAL WEATHER CONDITIONS, OR SIZE OF SEED PRECLUDE ADE-
QUATE NATURAL COVERING OF TREE SEED.

STEIN, WILLIAM I.

12 66095

APPRAISING EFFECTS OF PHYSICAL DAMAGE TO DOUGLAS-FIR SEED.
TENTH BIEN. WEST. FOREST NURSERY COUNC. MEETING PROC.
1966, 60-64.

IN THREE LOTS OF DOUGLAS-FIR SOME DAMAGED SEED PROVED TO
BE VIABLE, PRODUCED NORMAL GERMINANTS, AND SHOWED NO
CARRYOVER EFFECT TO RESULTING SEEDLINGS. THE NUMBER OF
SEEDLINGS PRODUCED IN SOIL FROM DAMAGED SEED MAY NOT
ALWAYS BE IN PROPORTION TO THE DAMAGED SEED'S CONTRI-
BUTION TO GERMINATION IN STANDARD LABORATORY TESTS.

STEIN, WILLIAM I.

8 66064

SELECTED 1964 AND 1965 PUBLICATIONS ON REFORESTATION.
IN 'WESTERN REFORESTATION.' WEST. FOREST. AND CONSERV.
ASS. WEST. REFOREST. COORDINATING COMM. PROC. 1965,
PP. 19-24.

COVERAGE INCLUDES MOST REFERENCES PERTAINING TO WESTERN
SPECIES AND SELECTED OTHER REFERENCES HAVING GENERAL
APPLICABILITY.

STRICKLER, GERALD S.

6 66043

SOIL AND VEGETATION ON THE STARKEY EXPERIMENTAL FOREST AND
RANGE.

SCC. AMER. FORESTERS PROC. 1965, 27-30.

THREE FOREST AND SIX GRASSLAND SOIL SERIES MAPPED ON THE
EXPERIMENTAL RANGE ARE DESCRIBED AND THE VEGETATION
CHARACTERISTICS OF EACH DISCUSSED. THE APPLICATION TO
RANGE RESEARCH AND MANAGEMENT PROGRAMS IS GIVEN.

TARRANT, ROBERT F., AND SILEN, ROY R.

11 66098

GROWTH AND NUTRIENT UPTAKE OF IRRIGATED YOUNG PONDEROSA
PINE AFTER FERTILIZER TREATMENTS.

SOIL SCI. SOC. AMER. PROC. 30, 796-799, ILLUS.

GROWTH OF IRRIGATED PONDEROSA PINE INCREASED AS AMOUNT
OF NITROGEN FERTILIZER WAS INCREASED. PHOSPHORUS
FERTILIZER IN COMBINATION WITH NITROGEN EITHER INCREASED
OR DECREASED GROWTH DEPENDING ON RATES USED. UNFERTI-
LIZED BUT IRRIGATED TREES GREW MUCH FASTER THAN UNIRRI-
GATED TREES NEARBY.

- TRAPPE, JAMES M. 2 66014
HYPOGEOUS FLESHY FUNGI IN WESTERN NORTH AMERICA. (ABSTR.)
NORTHWEST SCI. 40, 36. (NO COPIES AVAILABLE)
- TRAPPE, JAMES M., AND *SALINAS QUINARD, RODOLFO. 7 66059
CENOCOCCUM GRANIFORME IN MEXICO.
MYCOLOGIA 58, 647-648.
CONFIRMS EARLIER HYPOTHESIS OF OCCURRENCE IN TEMPERATE
TO ALPINE CLIMATIC ZONES WITHIN TROPICAL LATITUDES OF
NORTH AMERICA.
- WALL, BRIAN R. 6 66046
1965 OREGON TIMBER HARVEST.
U.S. FOREST SERV. RESOURCE BULL. PNW-16, 2 PP., ILLUS.
CHRONICLES TIMBER HARVEST BY OWNERSHIP FOR 1950-65 AND
GIVES DETAIL BY COUNTIES FOR 1965.
- WALL, BRIAN R. 12 66085
1965 WASHINGTON TIMBER HARVEST.
U.S. FOREST SERV. RESOURCE BULL. PNW-18, 2 PP., ILLUS.
CHRONICLES TIMBER HARVEST FOR 1950-65 AND GIVES DETAIL
BY COUNTIES FOR 1965.
- WALL, BRIAN R., GEDNEY, DONALD R., 10 66077
AND FORSTER, ROBERT B.
FOREST INDUSTRIES OF EASTERN WASHINGTON.
U.S. FOREST SERV. RESOURCE BULL. PNW-17, 32 PP., ILLUS.
BASED ON A 1963-64 SURVEY, THESE INDUSTRIES ARE
DESCRIBED IN TERMS OF WOOD CONSUMPTION, DEGREE OF MANU-
FACTURE, EQUIPMENT USED, AND RESIDUE DEVELOPMENT.
THIS STUDY ALSO SHOWS THE HISTORICAL DEVELOPMENT OF THE
LUMBER INDUSTRY IN TERMS OF PRODUCTION, DATED SAWMILL
ORIGIN, AND NUMBER OF SAWMILLS BY MILL-SIZE CLASS.
- *WEAR, J. F., POPE, ROBERT B., AND *ORR, P. W. 5 66033
AERIAL PHOTOGRAPHIC TECHNIQUES FOR ESTIMATING DAMAGE BY
INSECTS IN WESTERN FORESTS.
PACIFIC NORTHWEST FOREST AND RANGE EXP. STA., ILLUS.
A COMPREHENSIVE SURVEY WORK MANUAL ON THE USE OF AERIAL
PHOTOGRAPHIC PROCEDURES AND TECHNIQUES TO EVALUATE
FOREST INSECT DAMAGE ON FORESTED AREAS OF THE WESTERN
UNITED STATES.
- *WESTERN FOREST TREE SEED COUNCIL. 2 66020
SAMPLING AND SERVICE TESTING WESTERN CONIFER SEEDS.
(WRITTEN, REVISED, AND EDITED BY WILLIAM I. STEIN.)
36 PP. (COPIES AVAILABLE FROM WESTERN FORESTRY AND CON-
SERVATION ASSOCIATION, PORTLAND, OREGON.)
RECOMMENDED PRACTICES AND PROCEDURES ARE GIVEN FOR
DRAWING AND SUBMITTING TREE SEED SAMPLES FOR QUALITY
DETERMINATION. AVAILABLE LABORATORY TESTS ARE DESCRIBED
AND, WHEREVER APPLICABLE, EXPLANATIONS ARE REFERENCED

TO STANDARD TESTING RULES. RULES PERTINENT TO TREE SEED ARE REPRODUCED VERBATIM. INTERPRETATIONS OF GERMINATION DATA GENERALLY ACCEPTED IN SEED TRANSACTIONS ARE ALSO DISCUSSED BRIEFLY.

WILLIAMS, CARROLL B., JR. 4 66030
DIFFERENTIAL EFFECTS OF THE 1944-56 SPRUCE BUDWORM OUTBREAK IN EASTERN OREGON.

U.S. FOREST SERV. RES. PAP. PNW-33, 16 PP., ILLUS.
DEFOLIATION REDUCED GROWTH OF ALL EASTERN OREGON CONIFERS SUBJECTED TO THE 1944-56 SPRUCE BUDWORM OUTBREAK. THE GROWTH OF GRAND FIR WAS REDUCED THE MOST, ENGELMANN SPRUCE INTERMEDIATELY, AND DOUGLAS-FIR AND PONDEROSA PINE THE LEAST BY DEFOLIATION.

WILLIAMS, CARROLL B., JR. 4 66028
POSSIBLE GROUSE DAMAGE ON TRUE FIRS.

U.S. FOREST SERV. RES. NOTE PNW-39, 7 PP., ILLUS.
DEBUDDING, BELIEVED TO BE CAUSED BY OVERWINTERING GROUSE, WAS GREATER ON TRUE FIRS THAN ON PINE AND DOUGLAS-FIR. WESTERN HEMLOCK AND WESTERN REDCEDAR, GROWING IN ASSOCIATION WITH THE ABOVE SPECIES, WERE RELATIVELY UNDAMAGED.

WILLIAMS, CARROLL B., JR. 6 66042

SNOW DAMAGE TO CONIFEROUS SEEDLINGS AND SAPLINGS.

U.S. FOREST SERV. RES. NOTE PNW-40, 10 PP., ILLUS.
DOUGLAS-FIR SHOWED MOST AND WESTERN HEMLOCK LEAST DAMAGE AMONG SEEDLINGS OF FIVE CONIFEROUS SPECIES SUBJECTED TO HEAVY SNOWS DURING WINTER 1963-64. THE 1964 HEIGHT GROWTH OF ALL UNDAMAGED TREES MEASURED INCREASED OVER THAT IN 1963, WHEREAS, THAT OF DAMAGED TREES WAS LESS. MOST LEANING AND BENT TREES RETURNED TO NEAR NORMAL POSITIONS BY THE THIRD WEEK OF HEIGHT GROWTH.

WILLIAMSON, RICHARD L. 1 66010

SHELTERWOOD HARVESTING--TOOL FOR THE WOODS MANAGER.

PULP AND PAPER 40(1), 26-28, ILLUS.

SHELTERWOOD HARVESTING IN 60- TO 70-YEAR-OLD WESTERN HEMLOCK PROMISES NO LOSS OF INCREMENT IN THE SHELTERING STAND WHILE ASSURING RESTOCKING AT THE FINAL HARVEST CUT.

WILLIAMSON, RICHARD L. 2 66012

THINNING RESPONSE IN 110-YEAR-OLD DOUGLAS-FIR.

U.S. FOREST SERV. RES. NOTE PNW-36, 7 PP., ILLUS.

DOUGLAS-FIR STANDS, 110 YEARS OLD, THINNED IN 1952 TO 74 AND 55 PERCENT OF NORMAL BASAL AREA BY REMOVAL OF 21 AND 31 PERCENT OF INITIAL BASAL AREA, RESPECTIVELY, REQUIRED 6 YEARS FOR GROWTH TO ACHIEVE THAT OF THE UNTHINNED STAND.

WITTIG, GERTRAUDE.

1 66001

EGESTION TIME IN TWO SPECIES OF CATERPILLARS.

ANN. ENTOMOL. SOC. AMER. 59, 39-42.

THE EGESTION TIMES OF TWO INSTARS OF THE SALT-MARSH CATERPILLAR, ESTIGMENE ACREA (DRURY), AND THREE INSTARS OF THE VARIEGATED CUTWORM, PERIDROMA SAUCIA (HUBNER), WERE STUDIED BY FEEDING TWO VEGETABLES ALTERNATELY. THE MEAN EGESTION TIMES OBSERVED RANGED FROM 1-1/2 TO 8-1/4 HOURS. DIFFERENCES BETWEEN THE TWO VEGETABLES FOR A CERTAIN INSTAR AND THE DIFFERENCES AMONG THE INSTARS FOR A GIVEN VEGETABLE WERE EVALUATED.

WITTIG, GERTRAUDE.

12 66100

PHAGOCYTOSIS BY BLOOD CELLS IN HEALTHY AND DISEASED CATERPILLARS. II. A CONSIDERATION OF THE METHOD OF MAKING HEMOCYTE COUNTS.

J. INVERTEBRATE PATHOL. 8, 461-477, ILLUS.

THE EFFECTS OF INJECTIONS OF DISTILLED WATER, INDIA INK, AND 1.3-MICRON LATEX PARTICLES ON THE TOTAL AND DIFFERENTIAL HEMOCYTE COUNTS ARE DESCRIBED AND EVALUATED TOGETHER WITH PREVIOUSLY PUBLISHED RESULTS ON BACILLUS THURINGIENSIS. A PATTERN IS DEVISED FOR THE PHAGOCYTIC RESPONSE OF BLOOD CELLS IN PSEUDALETIA UNIPUNCTA.

WORTHINGTON, NORMAN P.

9 66075

LABOR REQUIREMENTS IN THINNING DOUGLAS-FIR AND WESTERN HEMLOCK ON TWO EXPERIMENTAL FORESTS IN WESTERN WASHINGTON.

U.S. FOREST SERV. RES. NOTE PNW-43, 12 PP., ILLUS.

DATA FROM 25 COMMERCIAL THINNING OPERATIONS OVER A 14-YEAR SPAN SHOW THAT LABOR REQUIREMENTS ARE RELATED TO AVERAGE DIAMETER OF TREES CUT, BUT NOT TO VOLUME CUT PER ACRE. IN TERMS OF LABOR REQUIREMENTS, THE TREE FARMER WAS FOUND TO BE MORE EFFICIENT FOR SKIDDING THAN EITHER HORSES OR CRAWLER TRACTORS.

WORTHINGTON, NORMAN P.

2 66019

RESPONSE TO THINNING 60-YEAR-OLD DOUGLAS-FIR.

U.S. FOREST SERV. RES. NOTE PNW-35, 5 PP., ILLUS.

A 30-YEAR RECORD FOR A SITE IV STAND SHOWS THAT HEAVY THINNING SUBSTANTIALLY DEPRESSED GROSS INCREMENT. A MODERATE THINNING REDUCED GROSS INCREMENT BUT SLIGHTLY.

WORTHINGTON, NORMAN P.

1 66004

WHAT THE FUTURE HOLDS FOR YOUNG-GROWTH TIMBER IN WESTERN WASHINGTON.

TECH. PAP. AMER. PULPWOOD ASS., APA QUART., P. 11.

A SIZABLE INCREASE IS INDICATED IN WESTERN WASHINGTON'S ALLOWABLE CUT OVER THE NEXT 25 YEARS. SPECIFIC RESEARCH WHICH HAS AND WILL ASSIST THIS INCREASE IS DISCUSSED.

The FOREST SERVICE of the U.S. DEPARTMENT OF AGRICULTURE is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives--as directed by Congress--to provide increasingly greater service to a growing Nation.